Using Software Packages in pkgsrc

The NetBSD Packages Collection (pkgsrc) is a third-party software package management system for Unix-like operating systems. Among the over 17,000 packages available in pkgsrc, a few hundred of them have been built on Pleiades and are available in the public directory **`/nasa/pkgsrc`**.

A new collection of software packages is released every quarter by the pkgsrc developers. In addition to new packages or updated versions, each release is largely comprised of the same packages (with identical version numbers) as previous releases.

Software Packages Available on NAS Systems

For a list of software programs that are currently available as packages, see Available Software Modules and Packages.

You can also see which pkgsrc modules are currently available by running **`module avail pkgsrc`**. For example:

```
pkgsrc/2020Q4  pkgsrc/2021Q2
```

are available on systems running TOSS 3, and

```
pkgsrc/2022Q1-rome
```

is currently the only one available on the Aitken Rome nodes running TOSS 4.

Note: On Endeavour3/4, which still uses the SUSE Linux Enterprise Server Version 12 (SLES 12) operating system, be aware that the only pkgsrc modules available are older than 2021.

Note: Although the discussion and examples below use **`pkgsrc/2021Q2`** and the path **`/nasa/pkgsrc/toss3/2021Q2`**, you should use **`pkgsrc/2022Q1-rome`** and the path **`/nasa/pkgsrc/toss4/2022Q1-rome`** when using the Aitken Rome nodes.

All of the source distributions for building the pkgsrc modules are stored in the **`/nasa/pkgsrc/distfiles`** directory. If you plan to build software from source, check to see whether the source distribution is already there before downloading the files from the internet.

To view a complete list of all packages and a one-line description of each package, load a pkgsrc module and type the **`pkg_info`** command without any additional options. If you are looking for a particular package, you can check whether it is available by using the **`grep`** command plus a keyword from the output of the **`pkg_info`** command.

TIP: Because some package names contain capital letters, add **`-i`** to the **`grep`** command to ignore case distinctions.
For example:

```
pfe% module load pkgsrc/2021Q2
pfe% pkg_info | grep -i cairo
cairo-1.16.0nb4         Vector graphics library with cross-device output support
cairo-gobject-1.16.0nb5 Vector graphics library with cross-device output support
py39-cairo-1.20.1       Python bindings for cairo
```

You can also use the -e option to test the existence of a given package. For example:

```
pfe% pkg_info -e cairo
```

```
pfe% cairo-1.16.0nb4
```

Once you know the package name, you can use additional **`pkg_info`** options to find more information about the package. You can specify the full package name, or you can leave out the version number. For example:

```
pfe% pkg_info -B cairo-1.16.0nb4
```

or

```
pfe% pkg_info -B cairo
```

Some useful options for **`pkg_info`** include:

-B
: shows build information of the package

-d
: shows a long description of the package

-L
: shows the files within the package

-N
: shows what other packages were used to build the package

-R
: shows what other packages require the package

Using Packages

The root directory of a pkgsrc release (for example, **`/nasa/pkgsrc/toss3/2021Q2`**) contains familiar directories such as **`bin`**, **`sbin`**, **`lib`**, **`include`**, **`man`**, and **`info`**. For most packages, you can find their executables, libraries, or include files in these directories.

Using an Executable

When you load a pkgsrc module, the paths to its **`bin`** and **`sbin`** directories are prepended to the **`PATH`** environment variable, as shown in the following example. Therefore, you do not need to provide full paths to these directories in order to run executables in them.

```
pfe% module show pkgsrc/2021Q2
-------------------------------------------------------------------
/nasa/modulefiles/pkgsrc/toss3/pkgsrc/2021Q2:

system           /bin/logger -p local2.info -t envmodule ychang1 display pkgsrc/2021Q2
module-whatis    A collection of software built via NetBSD's pkgsrc
prepend-path     INFOPATH /nasa/pkgsrc/toss3/2021Q2/info
prepend-path     MANPATH /nasa/pkgsrc/toss3/2021Q2/man
prepend-path     PATH /nasa/pkgsrc/toss3/2021Q2/bin:/nasa/pkgsrc/toss3/2021Q2/sbin
setenv           PKGSRC_BASE /nasa/pkgsrc/toss3/2021Q2
-------------------------------------------------------------------
```

Linking a Library

Unlike the **`PATH`** environment variable, loading a pkgsrc module does not set the LD_LIBRARY_PATH environment variable. The reason for this is to prevent libraries in the **`pkgsrc`** directory from overriding those with the same filenames at the system default locations or directories that may have been included in your existing LD_LIBRARY_PATH.

To link a static library (for example, **`libcairo.a`**) in the **`/nasa/pkgsrc/toss3/2021Q2/lib`** directory:

```
-I/nasa/pkgsrc/toss3/2021Q2/include
-L/nasa/pkgsrc/toss3/2021Q2/lib -lcairo
```

To link to a dynamic library (for example, **`libfftw.so`**) in the **`/nasa/pkgsrc/toss3/2021Q2/lib`** directory, follow the recommendations in the list below, in order of preference.

Note: Dynamic libraries have the suffix **`".so"`** rather than the suffix **`".a`**", which is used for static libraries.

- Set the LD_RUN_PATH environment variable as shown below prior to the link step. This will get **`/nasa/pkgsrc/toss3/2021Q2/lib`** encoded into the executable. Setting LD_RUN_PATH or LD_LIBRARY_PATH is not needed during run time.

  ```
  setenv LD_RUN_PATH /nasa/pkgsrc/toss3/2021Q2/lib
  -I/nasa/pkgsrc/toss3/2021Q2/include
  -L/nasa/pkgsrc/toss3/2021Q2/lib -lfftw
  ```
- Add the **`-Wl,-R`** linker option during the link step. This will also get **`/nasa/pkgsrc/toss3/2021Q2/lib`** encoded into the executable. Setting LD_RUN_PATH or LD_LIBRARY_PATH is not needed during run time.

  Note: The linker option **`-Wl,-R`** takes precedence over the LD_RUN_PATH setting.

  ```
  -I/nasa/pkgsrc/toss3/2021Q2/include
  -L/nasa/pkgsrc/toss3/2021Q2/lib -lfftw
  -Wl,-R/nasa/pkgsrc/toss3/2021Q2/lib
  ```
- Do not set LD_RUN_PATH or use the **`-Wl,-R`** linker option during the link step. Since **`/nasa/pkgsrc/toss3/2021Q2/lib`** is not encoded into the executable, you must set LD_LIBRARY_PATH during run time.

  Link time:

  ```
  -I/nasa/pkgsrc/toss3/2021Q2/include
  -L/nasa/pkgsrc/toss3/2021Q2/lib -lfftw
  ```

  Run time:

  ```
  setenv LD_LIBRARY_PATH "/nasa/pkgsrc/toss3/2021Q2/lib:$LD_LIBRARY_PATH"
  ```

For more information about using the **`setenv`** command, see **man setenv**.

The files of some packages are not installed in the **`bin, lib,`** and **`include`** directories. For example, the **`guile`** package is installed in the **`/nasa/pkgsrc/toss3/2021Q2/guile`** directory, which has its own **`bin`**, **`lib`**, and **`include`** subdirectories. The best way to find the exact location of a file you need from a package is to run the **`pkg_info`** command as follows:

```
pfe% pkg_info -L package_name
```

Separate modules have been created for some commonly used packages to make them easier to useâ   you can simply load the modulefile without loading a **`pkgsrc`** module. On systems running TOSS 3, these include:

- **`boost/1.76`**
- **`gcc/7.5`**
- **`gcc/9.3`**
- **`gcc/10.2`**
- **`gcc/10.3`**
- **`python3/3.9.5`**
- **`octave/6.2`**

On the Aitken Rome nodes running TOSS 4, the following modules from pkgsrc have been made available:

- **`boost/1.78`**
- **`gcc/6.5`**
- **`gcc/7.5`**
- **`gcc/8.4`**
- **`gcc/9.3`**
- **`gcc/10.3`**
- **`python3/3.9.12`**
- **`octave/6.4`**

Note: **`/usr/bin/python`** will no longer be linked to python2. To use python2, you must specify the whole path **`/usr/bin/python2`**.

Separate modules for other packages can be created when there is demand from the NAS user community.

For more information about pkgsrc, see https://www.pkgsrc.org.

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